Amendments to the Claims

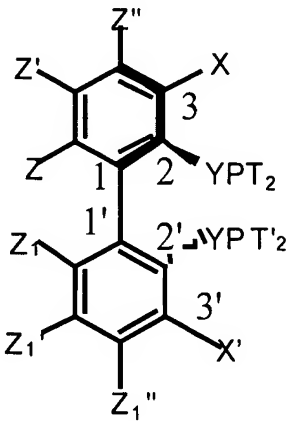
This listing will replace all prior versions and listings of claims in the application:

Listing of Claims

Claims 1-47. (canceled)

48. (new) A catalyst prepared by a process comprising:

contacting a transition metal salt, or a complex thereof, and a ligand selected from the group consisting of compounds represented by the formula or its enantiomer:



wherein each X and X' is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, halide, SiR_3, $P(O)R_2$, $P(O)(OR)_2$ and $P(OR)_2$;

wherein each Z and Z_1 is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, halide, SiR_3, $P(O)R_2$, $P(O)(OR)_2$ and $P(OR)_2$; or wherein Z and Z_1 together form the bridging group A-B-A_1;

wherein each Z', Z", Z_1' and Z_1" is independently selected from the group consisting of: H, alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, halide, SiR_3, $P(O)R_2$, $P(O)(OR)_2$ and $P(OR)_2$; or wherein Z' and Z together form the bridging group A'-B-A; Z' and Z together form a fused cycloaliphatic or aromatic group;

Z_1 and Z_1' together form the bridging group A_1-B_1-A_1'; and/or Z_1 and Z_1' together form a fused cycloaliphatic or aromatic group;

wherein each A, A', A_1 and A_1' is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO and a bond;

wherein each B and B_1 is independently selected from the group consisting of: linear, branched or cyclic alkylene of 1 to 6 carbon atoms, arylene of 6 to 12 carbon atoms, O, CH_2, NH, NR, S, CO, SO_2, P(O)R, P(O)OR, POR, SiR_2 and a bond;

wherein each T is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, substituted aryl, alkoxide, aryloxide, R, R', R", YR', YR", Y'R' and Y"R"; or wherein two T groups together form an alkylene, arylene, alkylenediamino, arylenediamino, alkelenedioxyl or arylenedioxyl;

wherein each T' is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, substituted aryl, alkoxide, aryloxide, R, R', R", YR', YR", Y'R' and Y"R"; or wherein two T' groups together form an alkylene, arylene, alkylenediamino, arylenediamino, alkelenedioxyl or arylenedioxyl;

wherein each R, R' and R" is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, aralkyl and alkaryl of 1 to 22 carbon atoms; or wherein two R groups, two R' groups or two R" group together form an alkylene or arelene group; and

wherein each Y, Y' and Y" is independently selected from the group consisting of: O, CH_2, NH, S and a bond between carbon and phosphorus; with the proviso that when the Y group at the 2' position is a bond between carbon and phosphorus, X' is hydrogen.

49. (new) The catalyst of claim 48, wherein said substituted alkyl has one or more substituents, each independently selected from the group consisting of: halogen, ester, ketone, carboxylic acid, hydroxy, alkoxy, aryloxy, thiol, alkylthio and dialkylamino.

50. (new) The catalyst of claim 48, wherein said alkylene is selected from the group consisting of compounds represented by the formula: $-(CH_2)_n-$, where n is an integer in the range of from 1 to 8.

51. (new) The catalyst of claim 48, wherein each of said aryl groups optionally has one or more substituents, each independently selected from the group consisting of: halogen, ester, ketone, sulfonate, phosphonate, hydroxy, alkoxy, aryloxy, thiol, alkylthiol, nitro, amino, vinyl, substituted vinyl, carboxylic acid, sulfonic acid and phosphine.

52. (new) The catalyst of claim 48, wherein each of said arylene groups optionally has one or more substituents, each independently selected from the group consisting of: halogen, ester, ketone, sulfonate, phosphonate, hydroxy, alkoxy, aryloxy, thiol, alkylthiol, nitro, amino, vinyl, substituted vinyl, carboxylic acid, sulfonic acid and phosphine.

53. (new) The catalyst of claim 48, wherein each of said arylene groups is independently selected from the group consisting of: 1,2-divalent phenyl, 2,2'-divalent-1,1'-biphenyl, 2,2'-divalent-1,1'-binaphthyl and ferrocene.

54. (new) The catalyst of claim 48, wherein said ligand is a racemic mixture of enantiomers.

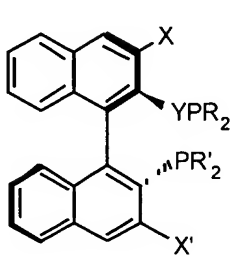
55. (new) The catalyst of claim 48, wherein said ligand is a non-racemic mixture of enantiomers.

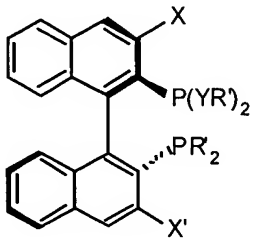
56. (new) The catalyst of claim 48, wherein said ligand is one of the enantiomers.

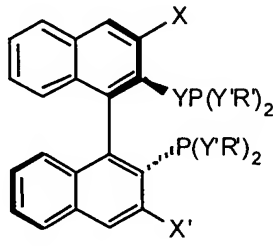
57. (new) The catalyst of claim 48, wherein said ligand has an optical purity of at least 85% ee.

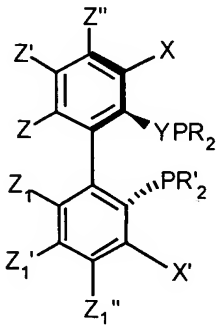
58. (new) The catalyst of claim 48, wherein said ligand has an optical purity of at least 95% ee.

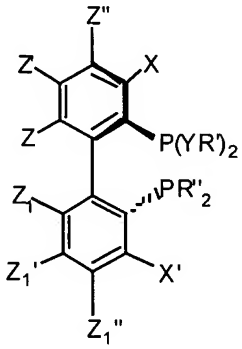
59. (new) The catalyst of claim 48, wherein said ligand is selected from the group consisting of compounds represented by the following formulas:

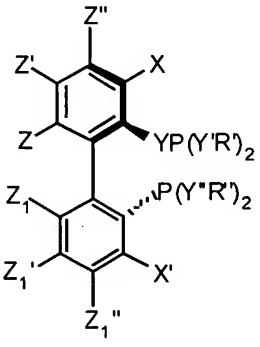


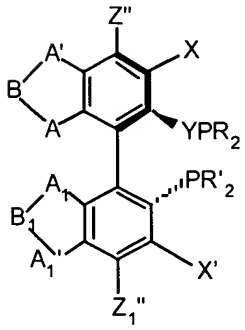


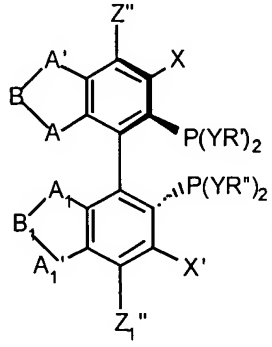


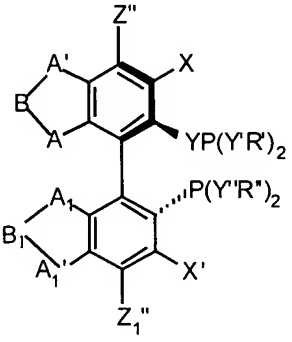


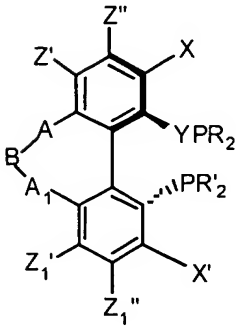


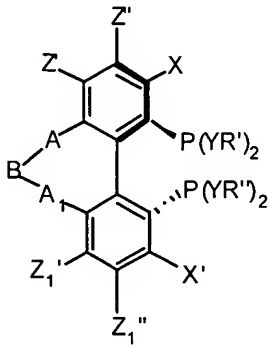


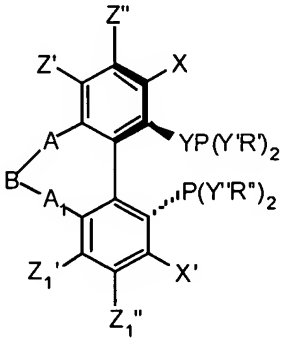












wherein each X and X' is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each Z and Z_1 is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide; or wherein Z and Z_1 together form the bridging group A-B-A_1;

wherein each Z', Z", Z_1' and Z_1" is independently selected from the group consisting of: H, alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide; or wherein Z' and Z together form the bridging group A'-B-A; Z' and Z together form a fused cycloaliphatic or aromatic group; Z_1 and Z_1' together form the bridging group A_1-B_1-A_1'; and/or Z_1 and Z_1' together form a fused cycloaliphatic or aromatic group;

wherein each A, A', A_1 and A_1' is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO and a bond;

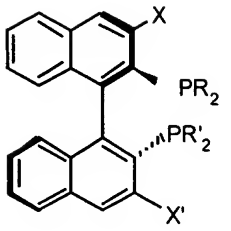
wherein each B and B_1 is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO, SO_2, and a bond;

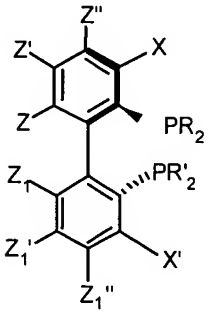
wherein each YR', YR", Y'R' and Y"R" is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, substituted aryl, alkoxide and aryloxide; or wherein two YR', YR", Y'R' or Y"R" groups together form an alkylene, arylene, alkylenediamino, arylenediamino, alkelenedioxyl or arylenedioxyl;

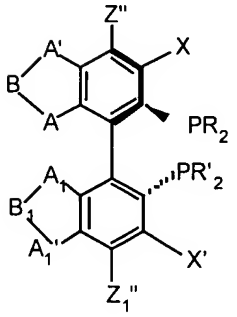
wherein each R, R' and R" is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, aralkyl and alkaryl of 1 to 22 carbon atoms; or wherein two R groups, two R' groups or two R" group together form an alkylene or arelene group; and

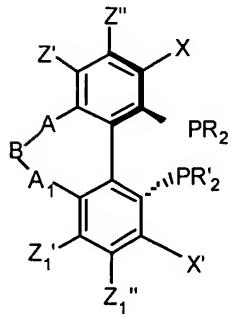
wherein each Y, Y' and Y" is independently selected from the group consisting of: CH_2, and a bond between carbon and phosphorus; with the proviso that when the Y group at the 2' position is a bond between carbon and phosphorus, X' is hydrogen.

60. (new) The catalyst of claim 48, wherein said ligand is selected from the group consisting of compounds represented by the following formulas:


X
PR2
PR'2
X'


Z"
Z'
X
Z
PR2
Z1
PR'2
Z1'
X'
Z1"


Z"
A'
X
B
A
PR2
A1
PR'2
B1
A1'
X'
Z1"


Z"
Z'
X
A
PR2
B
A1
PR'2
Z1'
X'
Z1"

wherein each X is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each X' is independently selected from the group consisting of: hydrogen, alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each Z and Z_1 is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each Z', Z", Z_1' and Z_1" is independently selected from the group consisting of: H, alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

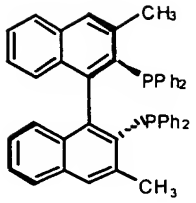
wherein each A, A', A_1 and A_1' is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO and a bond;

wherein each B and B_1 is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO, SO_2, and a bond;

wherein each R and R' is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, substituted aryl, aralkyl and alkaryl of 1 to 22 carbon atoms, alkoxide and aryloxide; or

wherein two R groups or two R' groups together form an alkylene, or arelene groups.

61. (new) The catalyst of claim 48, wherein said ligand is selected from the group consisting of compounds represented by the formulas:



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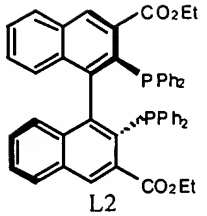

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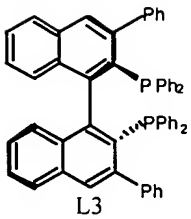

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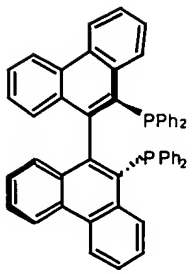

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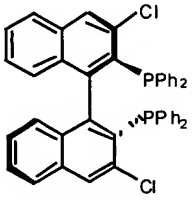

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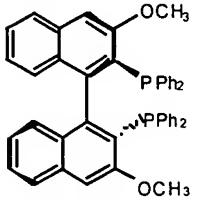

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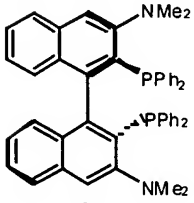

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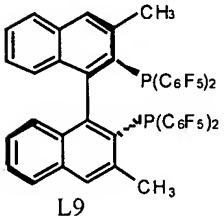

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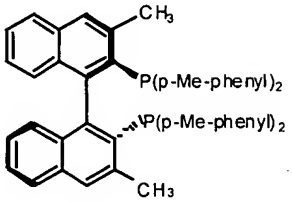

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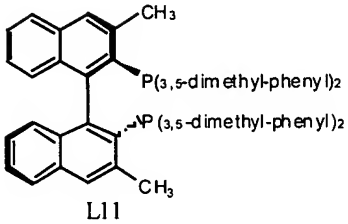

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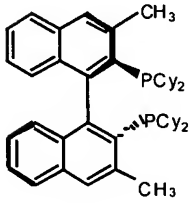

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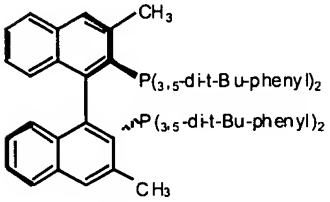

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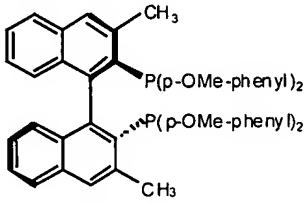

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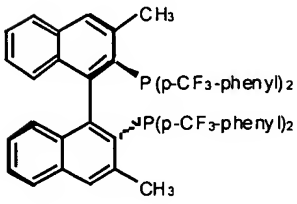

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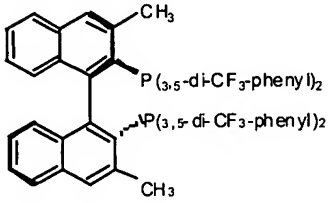

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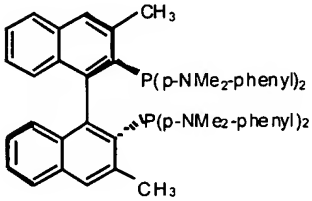

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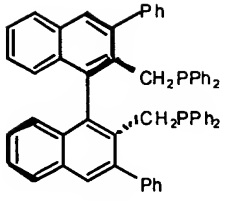

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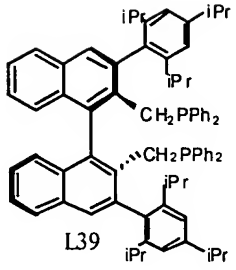

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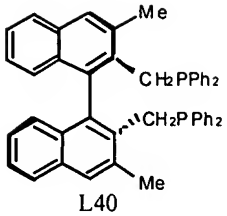

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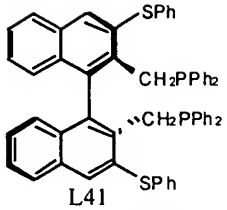

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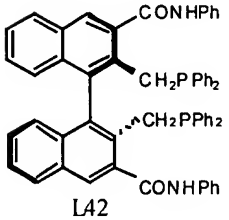

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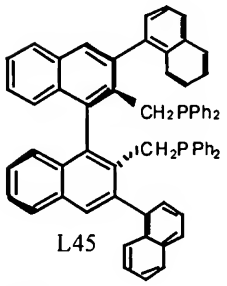

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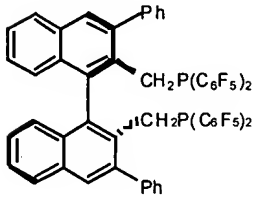

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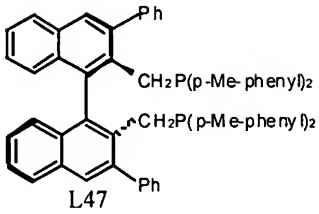

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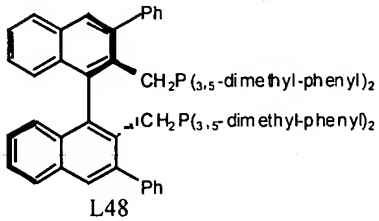

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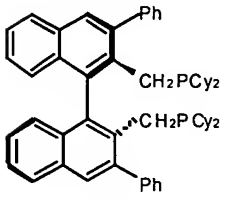

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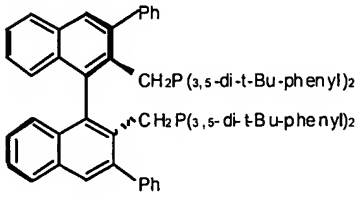

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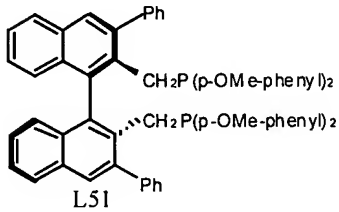

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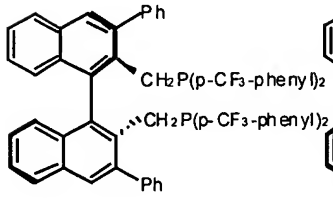

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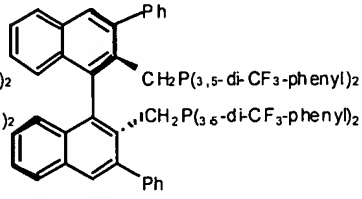

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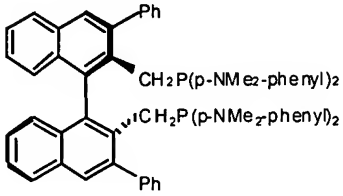

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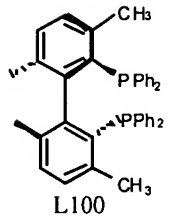
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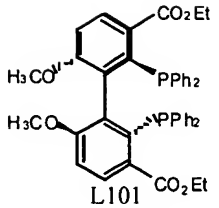
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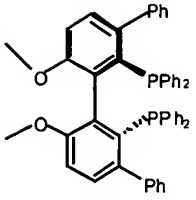
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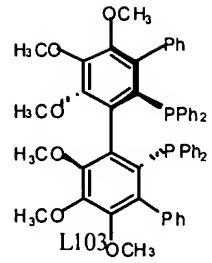
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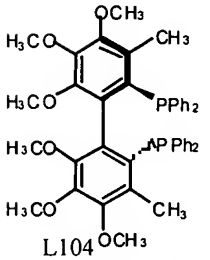
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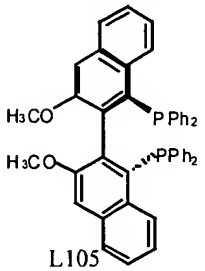
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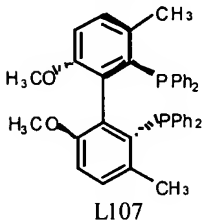
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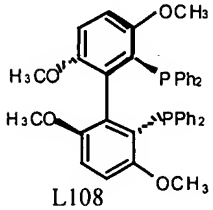
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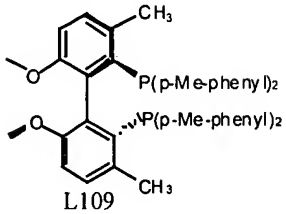
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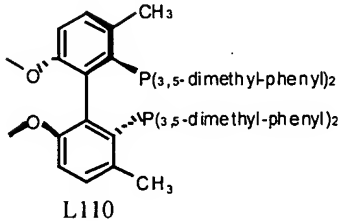
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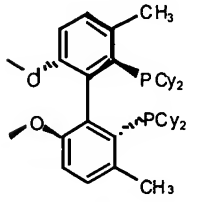
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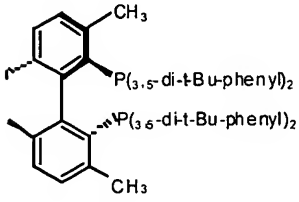
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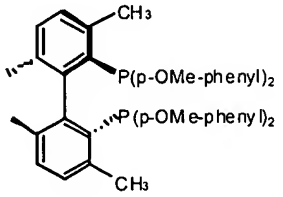
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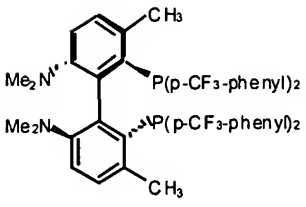
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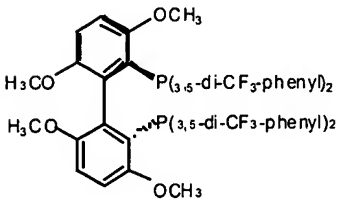
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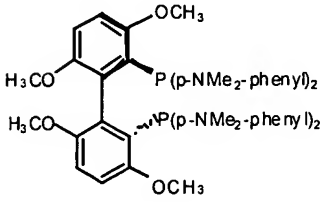
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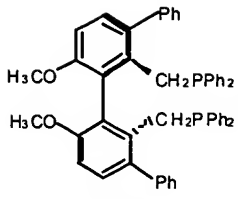

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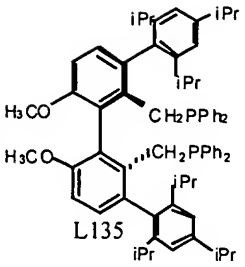

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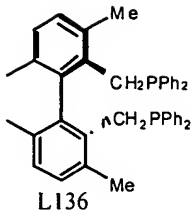

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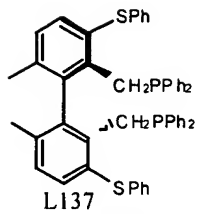

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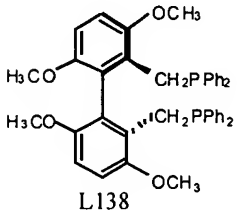

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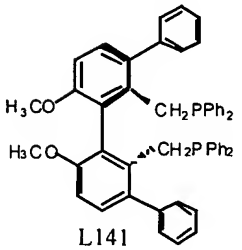

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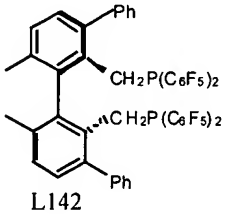

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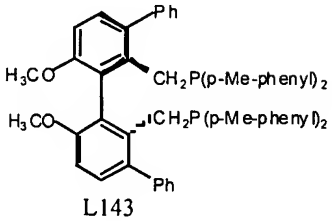

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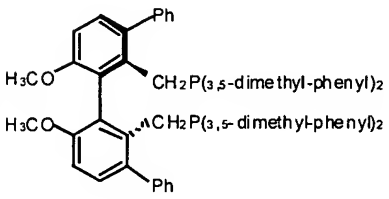

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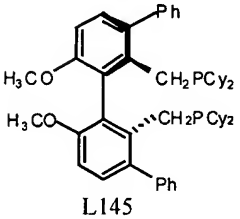

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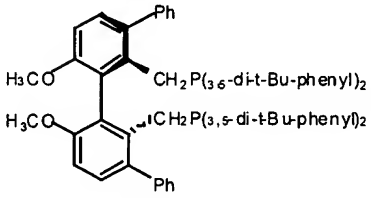

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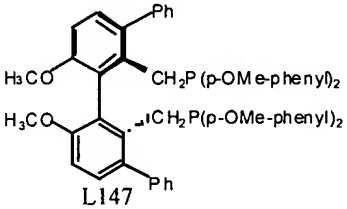

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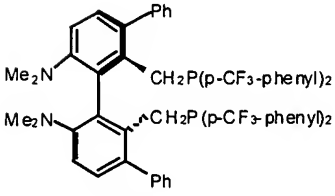

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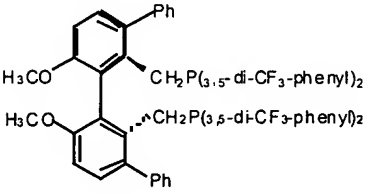

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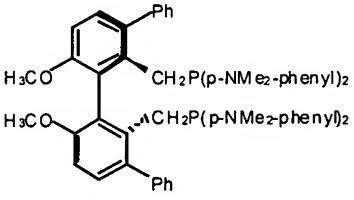

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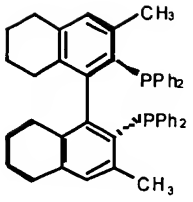

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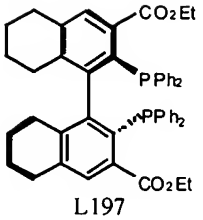

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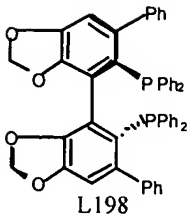

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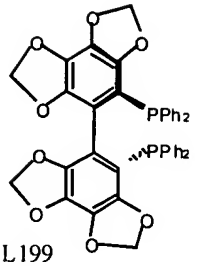

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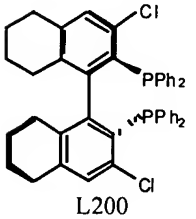

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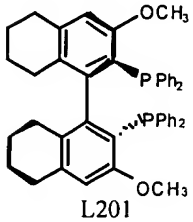

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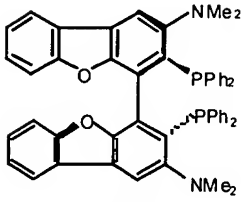

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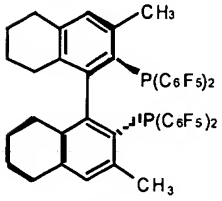

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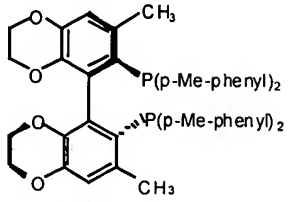

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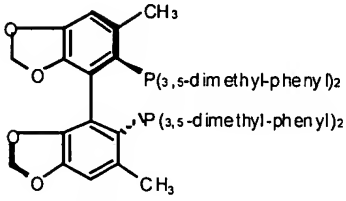

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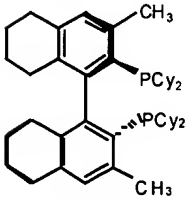

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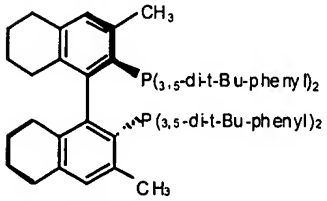

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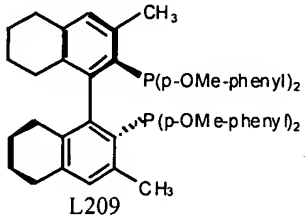

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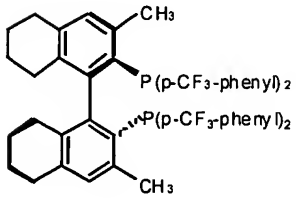

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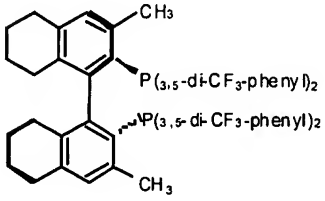

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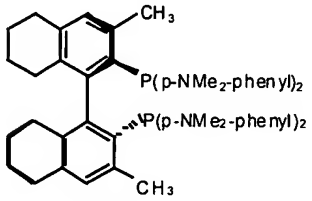

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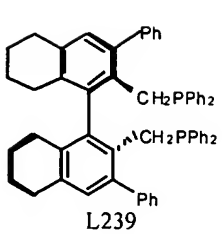

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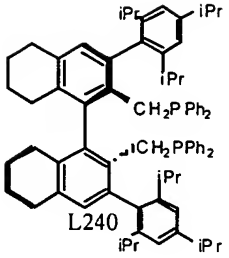

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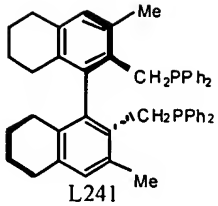

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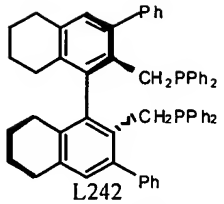

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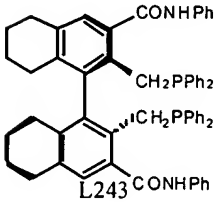

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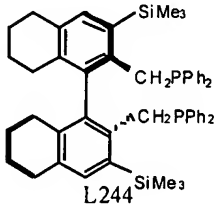

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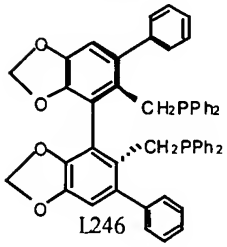

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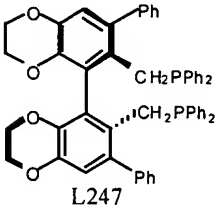

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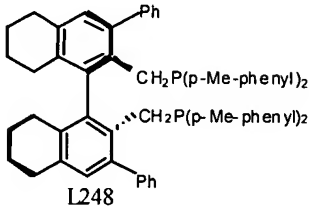

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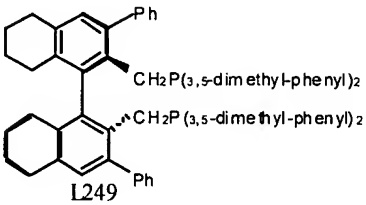

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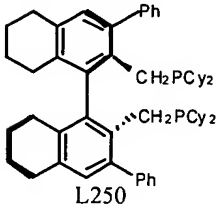

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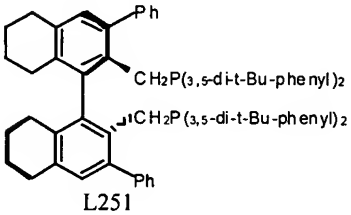

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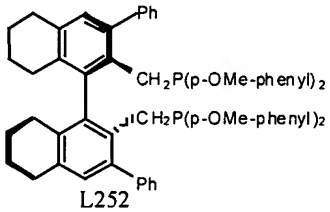

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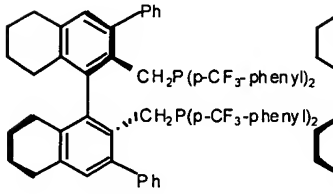

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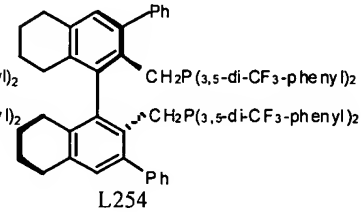

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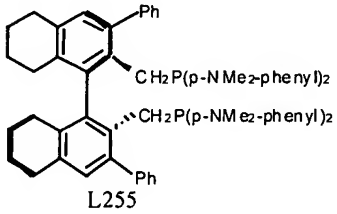

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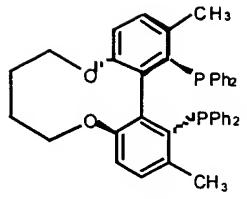

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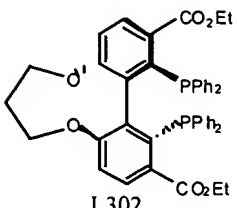

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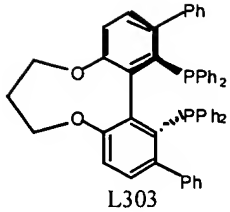

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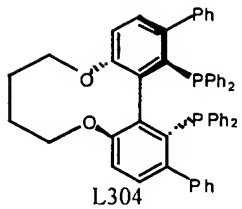

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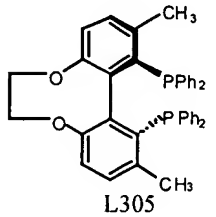

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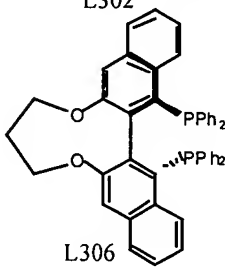

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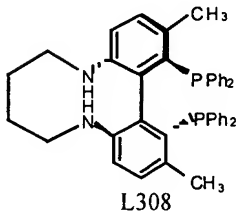

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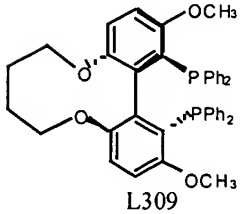

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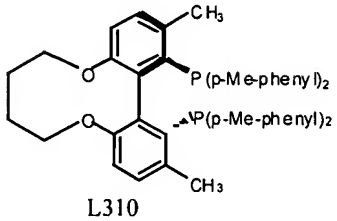

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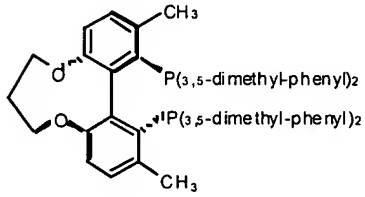

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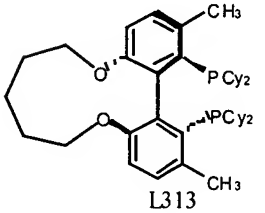

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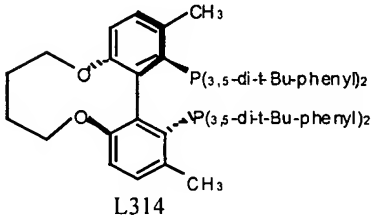

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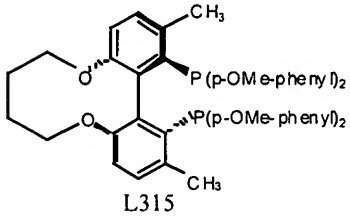

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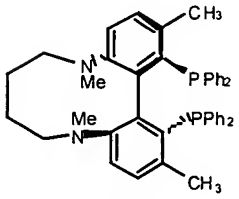

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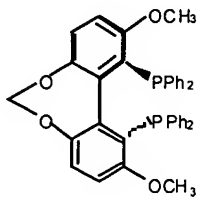

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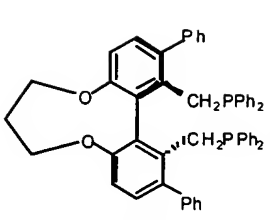

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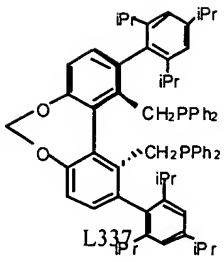

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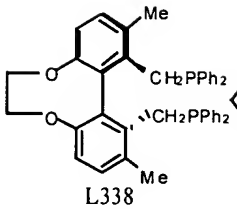

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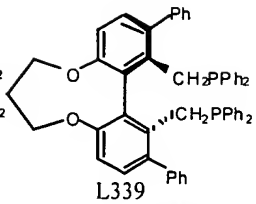

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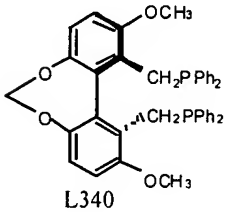

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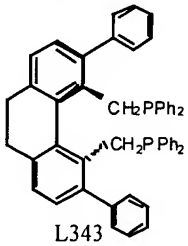

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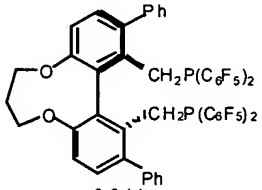

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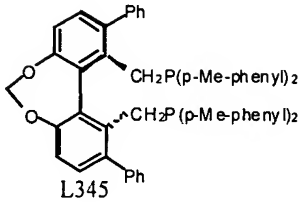

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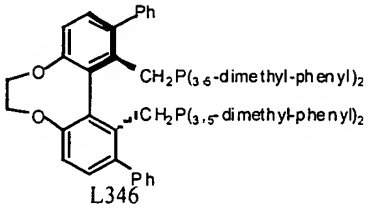

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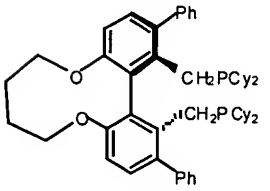

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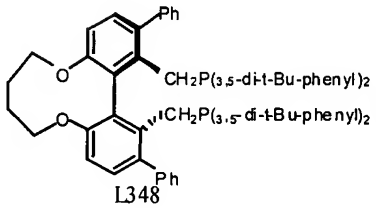

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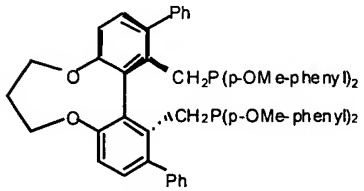

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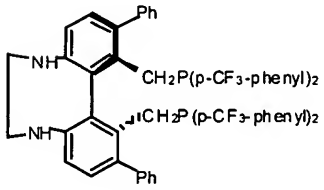

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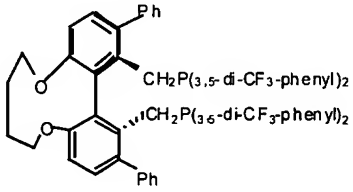

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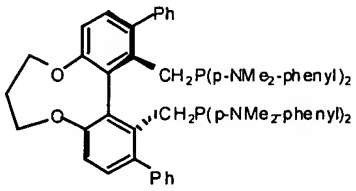
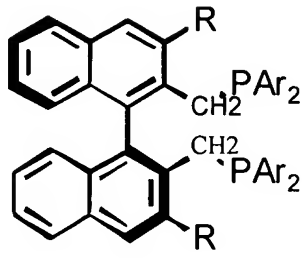


L352

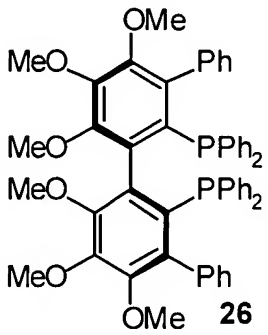
wherein Cy is a cyclohexyl group.

62. (new) The catalyst of claim 48, wherein said ligand is represented by the formula:



wherein each R is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, and substituted aryl; and wherein each Ar is independently selected from the group consisting of: phenyl, substituted phenyl, aryl and substituted aryl.

63. (new) The catalyst of claim 48, wherein said ligand is represented by the formula:



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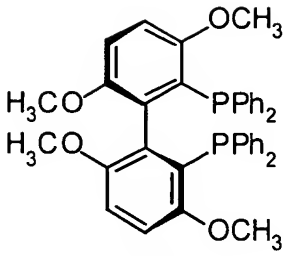
64. (new) The catalyst of claim 48, wherein said ligand is represented by the formula:



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65. (new) The catalyst of claim 48, wherein said transition metal is selected from the group consisting of:

Ag, Pt, Pd, Rh, Ru, Ir, Cu, Ni, Mo, Ti, V, Re and Mn.

66. (new) The catalyst of claim 48, wherein said transition metal is selected from the group consisting of:

Pt, Pd, Rh and Ru.

67. (new) The catalyst of claim 48, wherein said transition metal salt, or complex thereof, is selected from the group consisting of:

AgX; Ag(OTf); $Ag(OTf)_2$; AgOAc; $PtCl_2$; H_2PtCl_4; $Pd_2(DBA)_3$; $Pd(OAc)_2$; $PdCl_2(RCN)_2$; $(Pd(allyl)Cl)_2$; $Pd(PR_3)_4$; $(Rh(NBD)_2)X$; (Rh (NBD)$Cl)_2$; $(Rh(COD)Cl)_2$; $(Rh(COD)_2)X$; Rh(acac)$(CO)_2$; Rh(ethylene)$_2$(acac); (Rh(ethylene)$_2$Cl) $_2$; RhCl(PPh_3) $_3$; $Rh(CO)_2Cl_2$; RuHX$(L)_2$(diphosphine), $RuX_2(L)_2$ (diphosphine), Ru(arene)X_2(diphosphine), Ru(aryl group)X_2; Ru(RCOO)2(diphosphine); Ru(methallyl)2(diphosphine); Ru(aryl group)$X_2(PPh_3)$ $_3$; Ru(COD)(COT); Ru(COD)(COT)X; RuX_2(cymen); $Ru(COD)_n$; Ru(aryl group)X_2(diphosphine); $RuCl_2$(COD); $(Ru(COD)_2)X$; RuX_2(diphosphine); $RuCl_2(=CHR)(PR'_3)_2$; $Ru(ArH)Cl_2$; $Ru(COD)(methallyl)_2$; (Ir $(NBD)_2Cl)_2$; $(Ir(NBD)_2)X$; $(Ir(COD)_2Cl)_2$; $(Ir(COD)_2)X$; CuX $(NCCH_3)$ $_4$; Cu(OTf); $Cu(OTf)_2$; Cu(Ar)X; CuX; $Ni(acac)_2$; NiX_2; $(Ni(allyl)X)_2$; $Ni(COD)_2$;

$MoO_2(acac)_2$; $Ti(OiPr)_4$; $VO(acac)_2$; $MeReO_3$; MnX_2 and $Mn(acac)_2$; wherein each R and R' is independently selected from the group consisting of: alkyl or aryl; Ar is an aryl group; and X is a counteranion.

68. (new) The catalyst of claim 67, wherein L is a solvent molecule and wherein said counteranion X is selected from the group consisting of: halogen, BF_4, $B(Ar)_4$, wherein Ar is fluorophenyl or 3,5-di-trifluoromethyl-1-phenyl, ClO_4, SbF_6, PF_6, CF_3SO_3, RCOO and a mixture thereof .

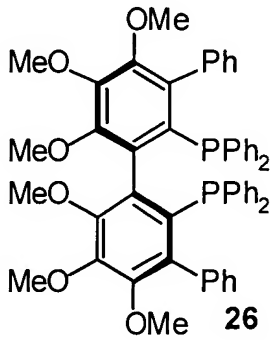
69. (new) The catalyst of claim 48, prepared in situ or as an isolated compound.

70. (new) The catalyst of claim 48, wherein said transition metal salt, or a complex thereof is selected from the group consisting of:

$[Rh(COD)Cl]_2$, $[Rh(COD)_2]X$, $[Ir(COD)Cl]_2$, $[Ir(COD)_2]X$, $Rh(acac)(CO)_2$, $Ni(allyl)X$, $Pd_2(dba)_3$, $[Pd(allyl)Cl]_2$, $Ru(RCOO)_2(diphosphine)$, $RuX_2(diphosphine)$, $Ru(methylallyl)_2(diphosphine)$ and $Ru(aryl)X_2(diphosphine)$, wherein X is selected from the group consisting of: BF_4, ClO_4, SbF_6, CF_3SO_3, Cl and Br; and

wherein said ligand is selected from the group consisting of compounds represented by the formula:

(a)



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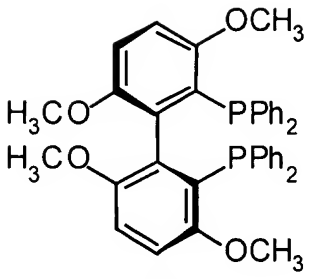
(b)



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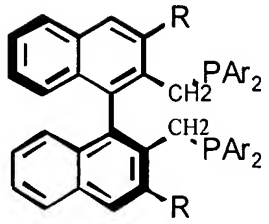
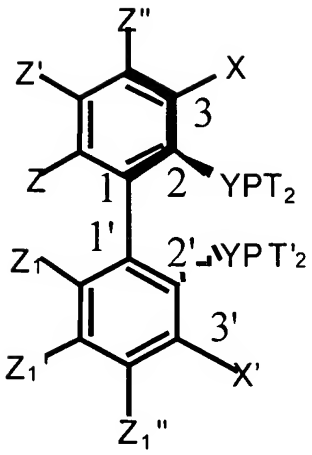
(c)



and a combination thereof.

71. (new) A process for preparation of an asymmetric compound comprising:

contacting a substrate capable of forming an asymmetric product by an asymmetric reaction and a catalyst prepared by a process comprising: contacting a transition metal salt, or a complex thereof, and a ligand selected from the group consisting of compounds represented by the formula or its enantiomer:



wherein each X and X' is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each Z and Z_1 is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR and halide; or wherein Z and Z_1 together form the bridging group A-B-A_1;

wherein each Z', Z", Z_1' and Z_1" is independently selected from the group consisting of: H, alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide; or wherein Z' and Z together form the bridging group A'-B-A; Z' and Z together form a fused cycloaliphatic or aromatic group; Z_1 and Z_1' together form the bridging group A_1-B_1-A_1'; and/or Z_1 and Z_1' together form a fused cycloaliphatic or aromatic group;

wherein each A, A', A_1 and A_1' is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO and a bond;

wherein each B and B_1 is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO, SO_2, and a bond;

wherein each T is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, substituted aryl, alkoxide, aryloxide, R, R', and R"; or wherein two T groups together form an alkylene or arylene;

wherein each T' is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, substituted aryl, alkoxide, aryloxide, R, R', and R"; or wherein two T' groups together form an alkylene or arylene;

wherein each R, R' and R" is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, aralkyl and alkaryl of 1 to 22 carbon atoms; or wherein two R groups, two R' groups or two R" group together form an alkylene, arelene or substituted arylene group; and

wherein each Y, Y' and Y" is independently selected from the group consisting of: CH_2 and a bond between carbon and phosphorus; with the proviso that when the Y group at the 2' position is a bond between carbon and phosphorus, X' is hydrogen.

72. (new) The process of claim 71, wherein said asymmetric reaction is selected from the group consisting of: hydrogenation, hydride transfer, allylic alkylation, hydrosilylation, hydroboration, hydrovinylation, hydroformylation, olefin metathesis, hydrocarboxylation, isomerization, cyclopropanation, Diels-Alder reaction, Heck reaction, isomerization, Aldol reaction, Michael addition, epoxidation, kinetic resolution and [m+n] cycloaddition wherein m = 3 to 6 and n = 2.

73. (new) The process of claim 72, wherein said asymmetric reaction is hydrogenation and said substrate is selected from the group consisting of: imine, ketone, ethylenically unsaturated compound, enamine, enamide and vinyl ester.

74. (new) The process of claim 72, wherein said asymmetric reaction is a silver-catalyzed asymmetric [3 +2] cycloaddition of an azomethine ylide with a dipolarophile.

75. (new) The process of claim 72, wherein said asymmetric reaction is a palladium-catalyzed allylic alkylation and said substrate is an allylic ester.

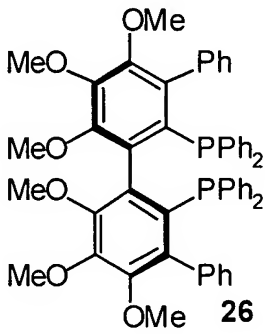
76. (new) The process of claim 72, wherein said asymmetric palladium-catalyzed allylic alkylation reaction is a kinetic resolution reaction and said substrate is a racemic allylic ester.

77. (new) The process of claim 72, wherein said asymmetric reaction is hydrogenation, said substrate is a beta-ketoester, said transition metal is Ru and said asymmetric compound is a beta-hydroxyester.

78. (new) The process of claim 72, wherein said asymmetric reaction is hydrogenation, said substrate is an enamide, said transition metal is Ru and said asymmetric compound is a beta amino acid.

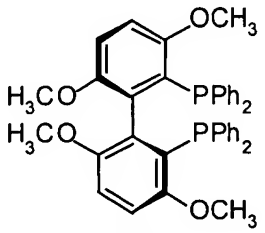
79. (new) The process of claim 72, wherein said ligand is selected from the group consisting of compounds represented by the formula:

(a)



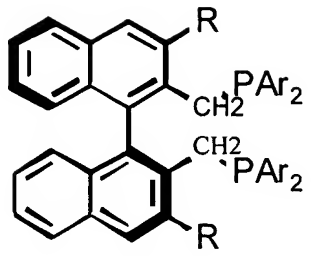
26

(b)



32

(c)



and a combination thereof.

80. (new) The process of claim 79, wherein said asymmetric reaction is hydrogenation, said substrate is a beta-ketoester, said transition metal is Ru and said asymmetric compound is a beta-hydroxyester.

81. (new) The process of claim 79, wherein said asymmetric reaction is hydrogenation, said substrate is an enamide, said transition metal is Ru and said asymmetric compound is a beta amino acid.

82. (new) The process of claim 71, wherein said substituted alkyl has one or more substituents, each independently selected from the group consisting of: halogen, ester, ketone, carboxylic acid, hydroxy, alkoxy, aryloxy, thiol, alkylthio and dialkylamino.

83. (new) The process of claim 71, wherein said alkylene is selected from the group consisting of compounds represented by the formula: $-(CH_2)_n-$, where n is an integer in the range of from 1 to 8.

84. (new) The process of claim 71, wherein each of said aryl groups optionally has one or more substituents, each independently selected from the group consisting of: halogen, ester, ketone, sulfonate, phosphonate, hydroxy, alkoxy, aryloxy, thiol,

alkylthiol, nitro, amino, vinyl, substituted vinyl, carboxylic acid, sulfonic acid and phosphine.

85. (new) The process of claim 71, wherein each of said arylene groups optionally has one or more substituents, each independently selected from the group consisting of: halogen, ester, ketone, sulfonate, phosphonate, hydroxy, alkoxy, aryloxy, thiol, alkylthiol, nitro, amino, vinyl, substituted vinyl, carboxylic acid, sulfonic acid and phosphine.

86. (new) The process of claim 71, wherein each of said arylene groups is independently selected from the group consisting of: 1,2-divalent phenyl, 2,2'-divalent-1,1'-biphenyl, 2,2'-divalent-1,1'-binaphthyl and ferrocene.

87. (new) The process of claim 71, wherein said ligand is a racemic mixture of enantiomers.

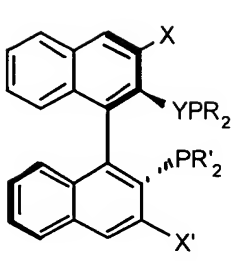
88. (new) The process of claim 71, wherein said ligand is a non-racemic mixture of enantiomers.

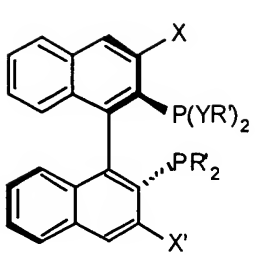
89. (new) The process of claim 71, wherein said ligand is one of the enantiomers.

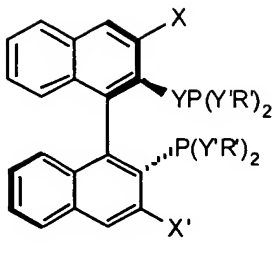
90. (new) The process of claim 71, wherein said ligand has an optical purity of at least 85% ee.

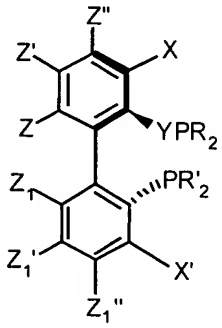
91. (new) The process of claim 71, wherein said ligand has an optical purity of at least 95% ee.

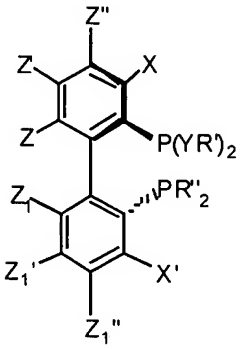
92. (new) The process of claim 71, wherein said ligand is selected from the group consisting of compounds represented by the following formulas:

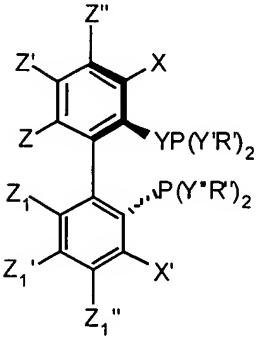

X
YPR2
PR'2
X'

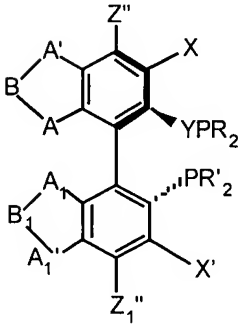

X
P(YR')2
PR'2
X'

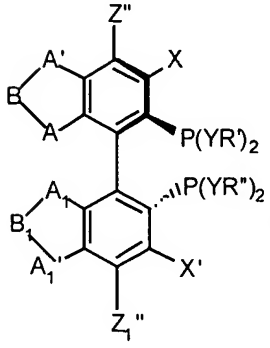

X
YP(Y'R')2
P(Y'R')2
X'

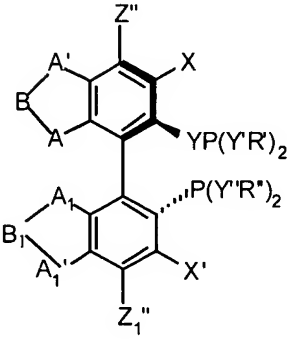

Z"
Z'
X
Z
YPR2
Z1
PR'2
Z1'
X'
Z1"

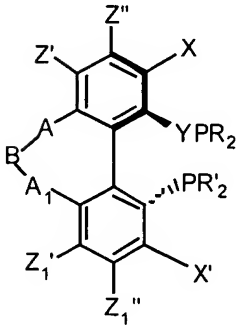

Z"
Z'
X
Z
P(YR')2
Z1
PR'2
Z1'
X'
Z1"

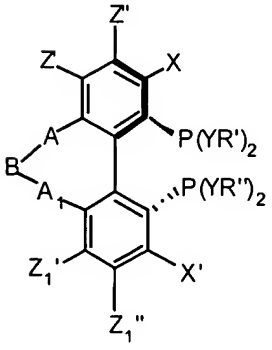

Z"
Z'
X
Z
YP(Y'R')2
Z1
P(Y"R')2
Z1'
X'
Z1"

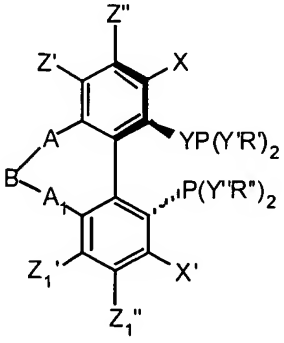

Z"
A'
X
B
A
YPR2
A1
PR'2
B1
A1'
X'
Z1"


Z"
A'
X
B
A
P(YR')2
A1
P(YR")2
B1
A1'
X'
Z1"


Z"
A'
X
B
A
YP(Y'R')2
A1
P(Y'R")2
B1
A1'
X'
Z1"


Z"
Z'
X
A
YPR2
B
A1
PR'2
Z1'
X'
Z1"


Z"
Z'
X
A
P(YR')2
B
A1
P(YR")2
Z1'
X'
Z1"


Z"
Z'
X
A
YP(Y'R')2
B
A1
P(Y'R")2
Z1'
X'
Z1"

wherein each X and X' is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each Z and Z_1 is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide; or wherein Z and Z_1 together form the bridging group A-B-A_1;

wherein each Z', Z", Z_1' and Z_1" is independently selected from the group consisting of: H, alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide; or wherein Z' and Z together form the bridging group A'-B-A; Z' and Z together form a fused cycloaliphatic or aromatic group; Z_1 and Z_1' together form the bridging group A_1-B_1-A_1'; and/or Z_1 and Z_1' together form a fused cycloaliphatic or aromatic group;

wherein each A, A', A_1 and A_1' is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO and a bond;

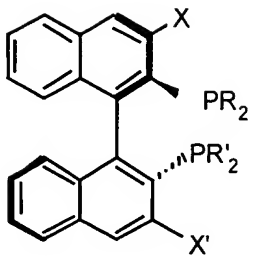
wherein each B and B_1 is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO, SO_2, and a bond;

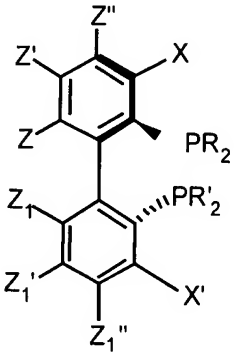
wherein each YR', YR", Y'R' and Y"R" is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, substituted aryl, alkoxide and aryloxide; or wherein two YR', YR", Y'R' or Y"R" groups together form an alkylene, arylene, alkylenediamino, arylenediamino, alkelenedioxyl or arylenedioxyl;

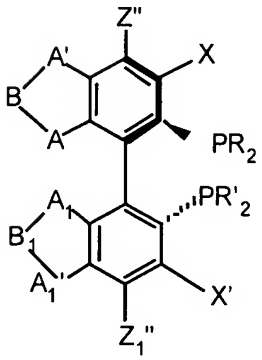
wherein each R, R' and R" is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, aralkyl and alkaryl of 1 to 22 carbon atoms; or wherein two R groups, two R' groups or two R" group together form an alkylene or arelene group; and

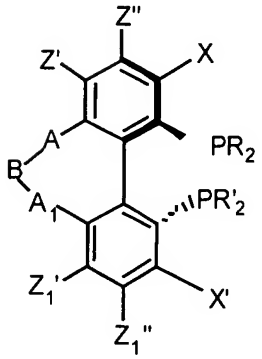
wherein each Y, Y' and Y" is independently selected from the group consisting of: CH_2, and a bond between carbon and phosphorus; with the proviso that when the Y group at the 2' position is a bond between carbon and phosphorus, X' is hydrogen.

93. (new) The process of claim 71, wherein said ligand is selected from the group consisting of compounds represented by the following formulas:


X
PR2
PR'2
X'


Z"
Z'
X
Z
PR2
Z1
PR'2
Z1'
X'
Z1"


Z"
A'
X
B
A
PR2
A1
PR'2
B1
A1'
X'
Z1"


Z"
Z'
X
A
PR2
B
A1
PR'2
Z1'
X'
Z1"

wherein each X is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each X' is independently selected from the group consisting of: hydrogen, alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each Z and Z_1 is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

wherein each Z', Z", Z_1' and Z_1" is independently selected from the group consisting of: H, alkyl, aryl, substituted alkyl, substituted aryl, OR, SR, NR_2, COOR, and halide;

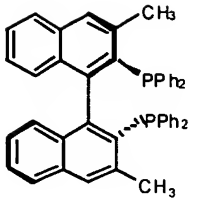
wherein each A, A', A_1 and A_1' is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO and a bond;

wherein each B and B_1 is independently selected from the group consisting of: O, CH_2, NH, NR, S, CO, SO_2, and a bond;

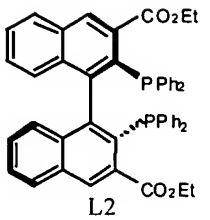
wherein each R and R' is independently selected from the group consisting of: alkyl, substituted alkyl, aryl, substituted aryl, aralkyl and alkaryl of 1 to 22 carbon atoms, alkoxide and aryloxide; or

wherein two R groups or two R' groups together form an alkylene, or arelene groups.

94. (new) The process of claim 71, wherein said ligand is selected from the group consisting of compounds represented by the formulas:



L1



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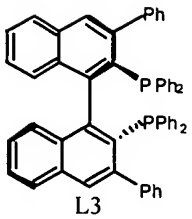

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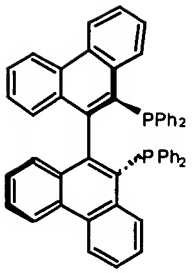

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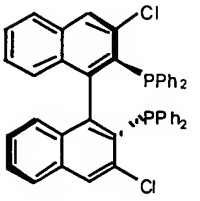

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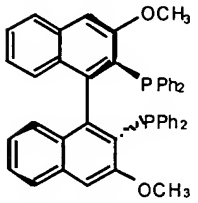

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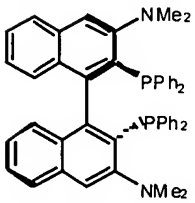

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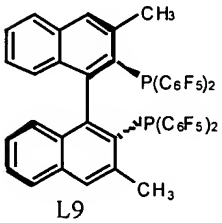

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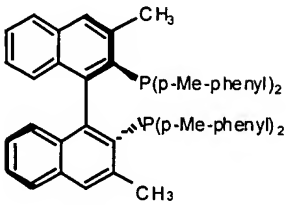

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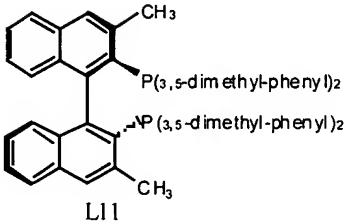

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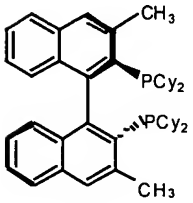

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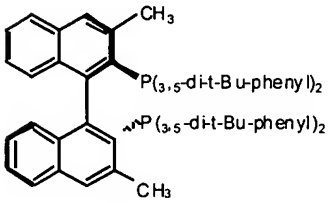

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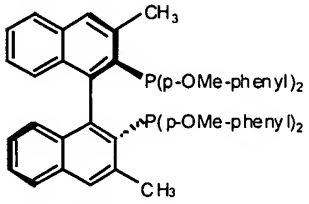

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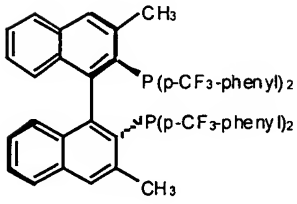

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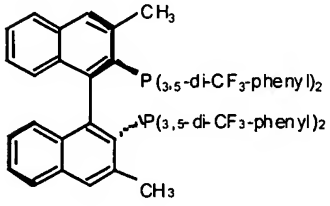

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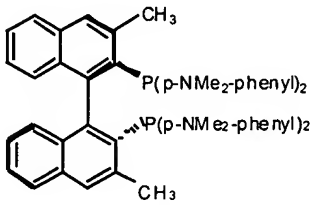

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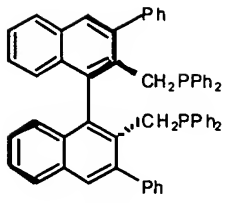

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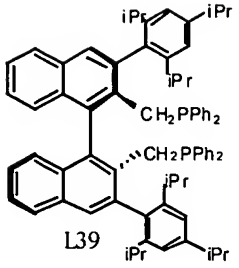

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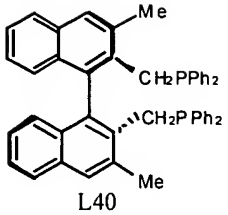

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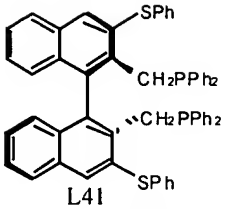

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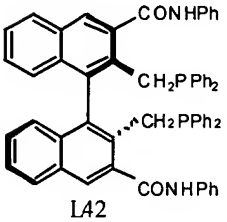
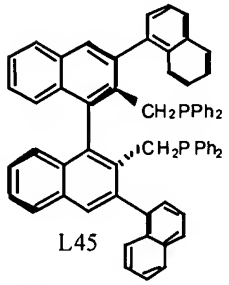


L42



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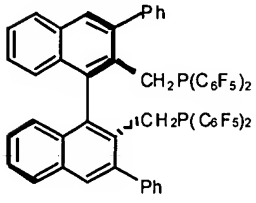

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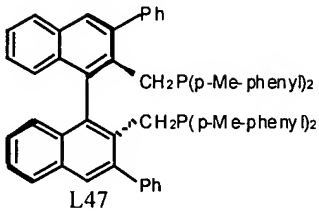

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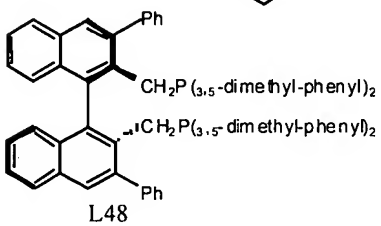

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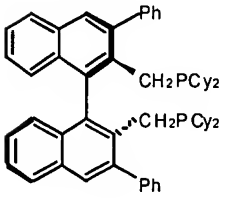

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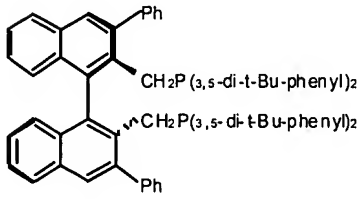

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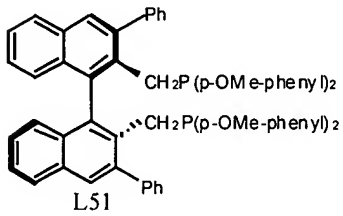

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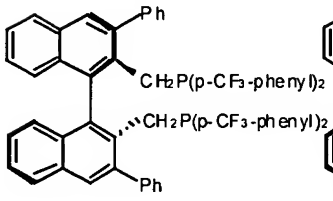

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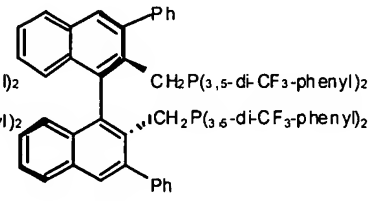

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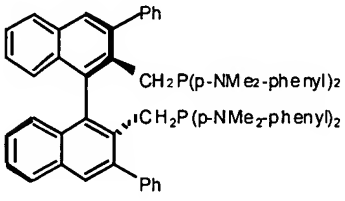

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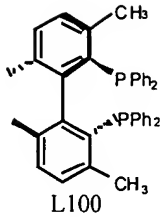
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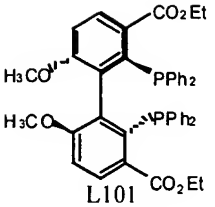
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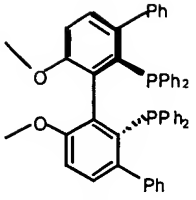
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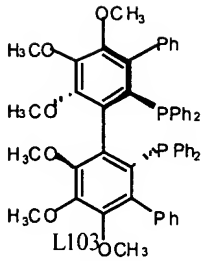
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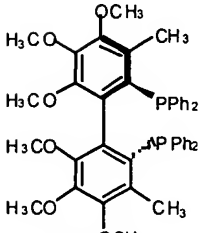
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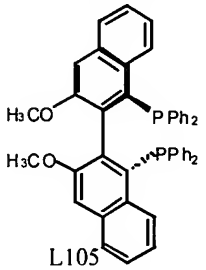
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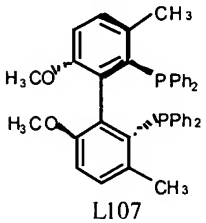
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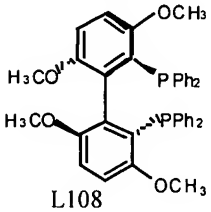
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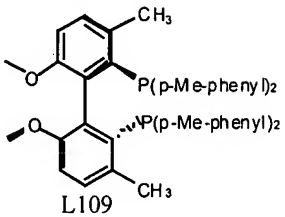
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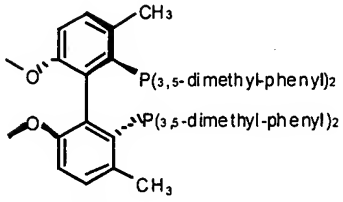
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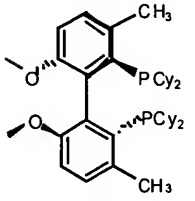
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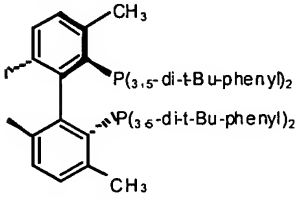
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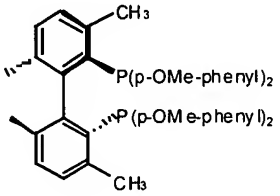
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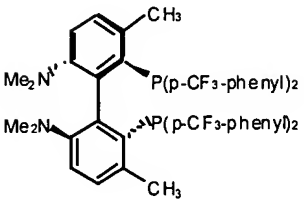
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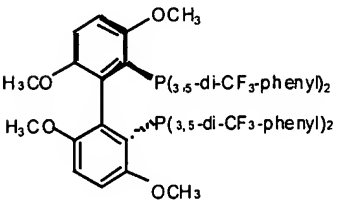
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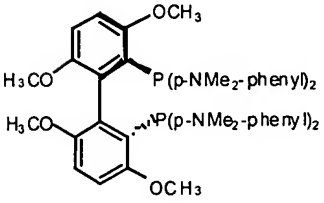
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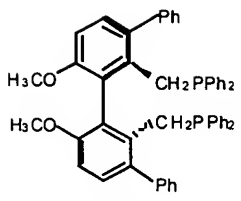

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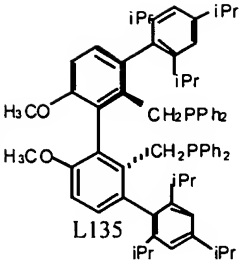

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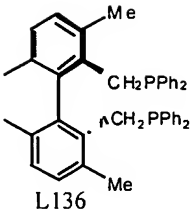

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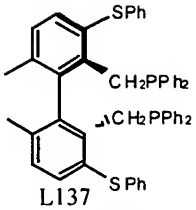

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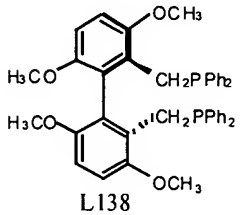

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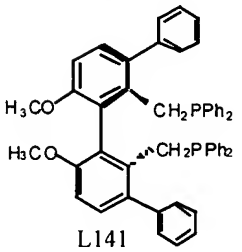

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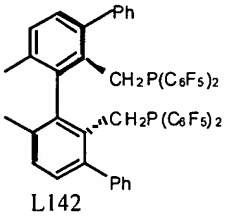

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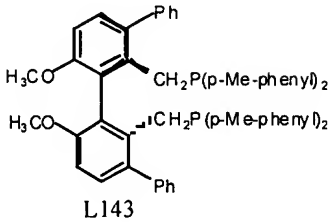

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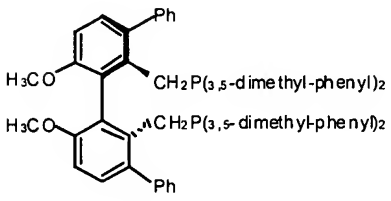

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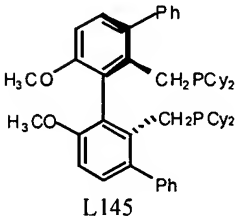

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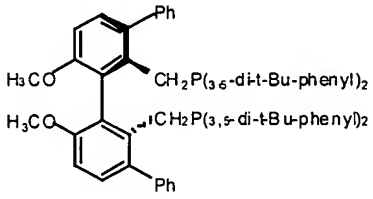

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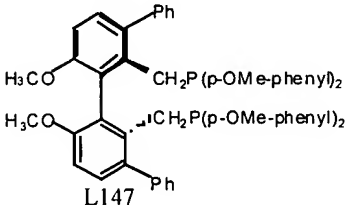

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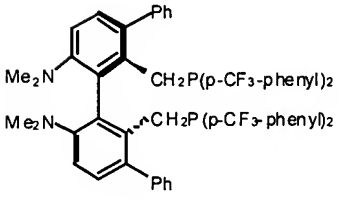

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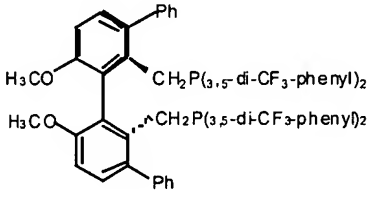

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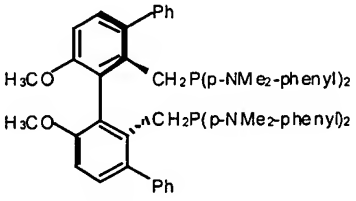

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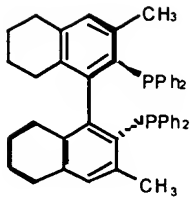

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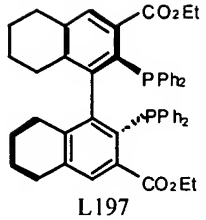

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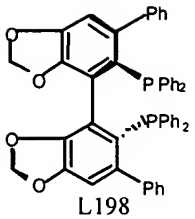

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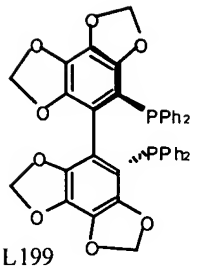

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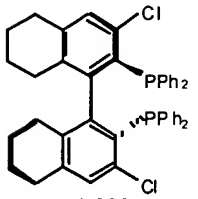

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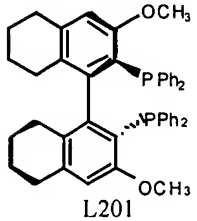

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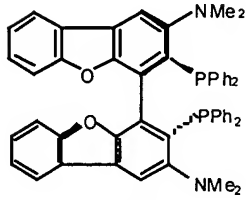

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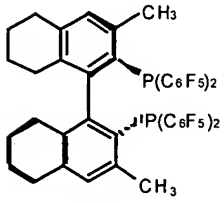

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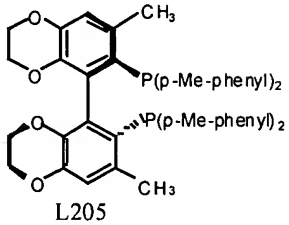

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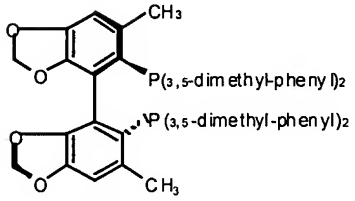

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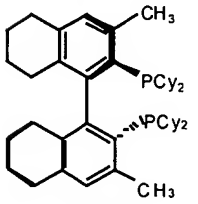

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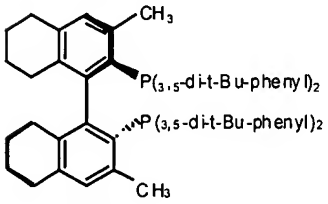

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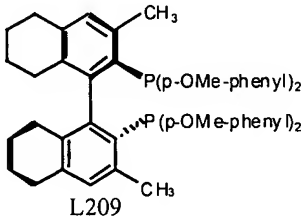

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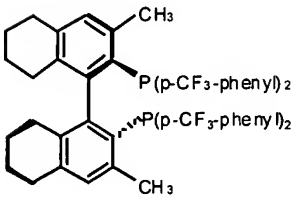

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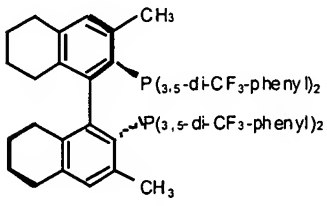

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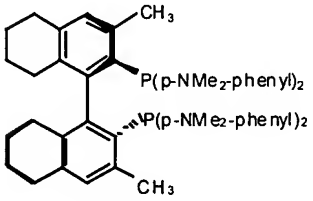

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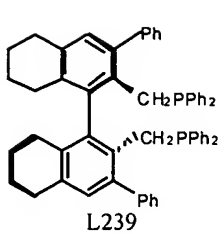

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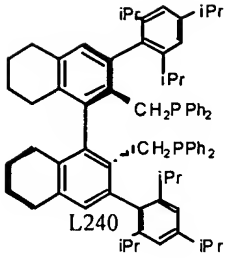

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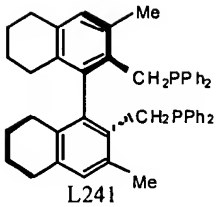

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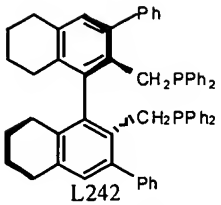

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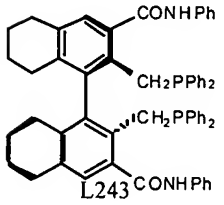

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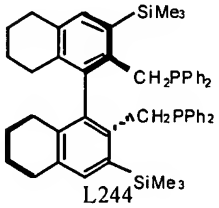

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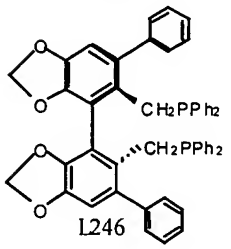

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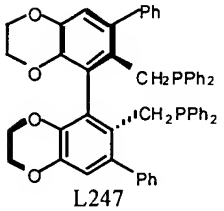

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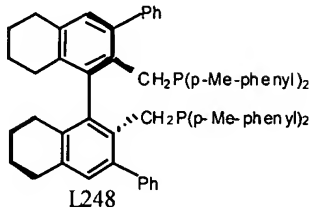

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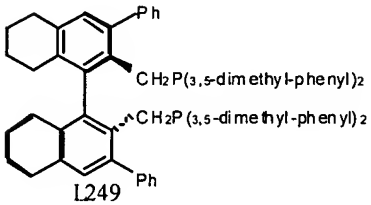

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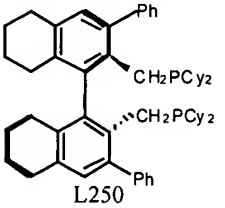

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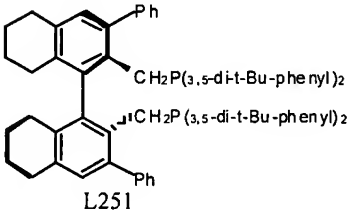

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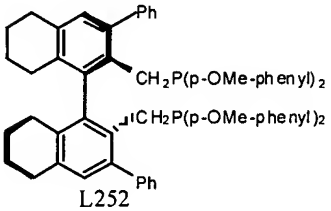

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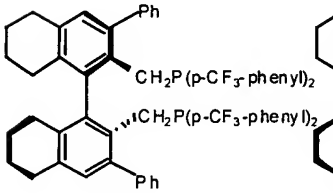

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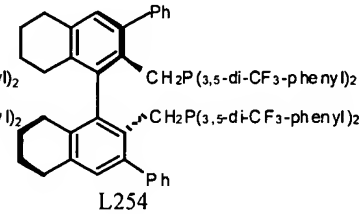

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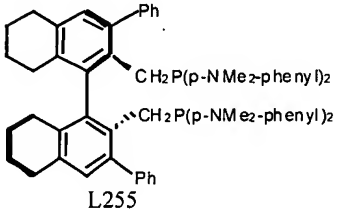

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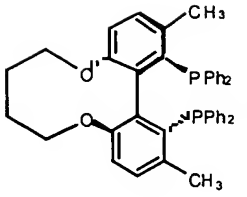
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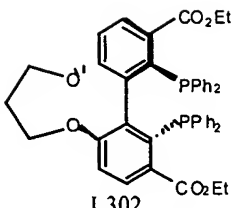
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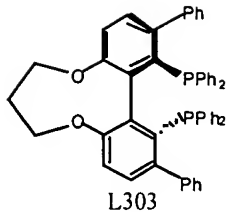
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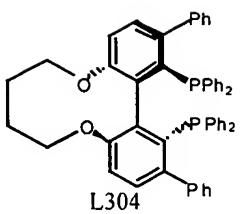
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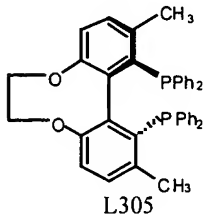
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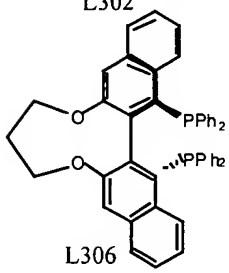
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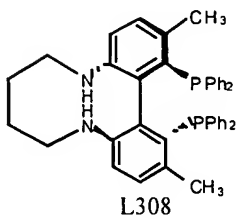
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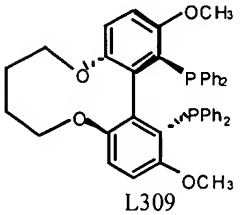
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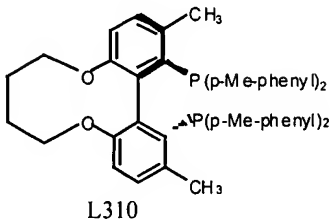
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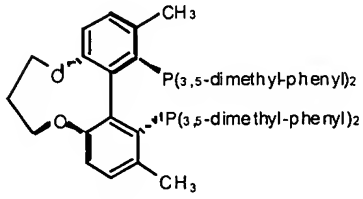
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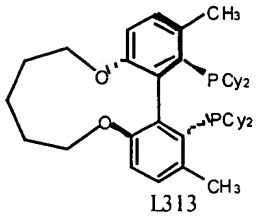
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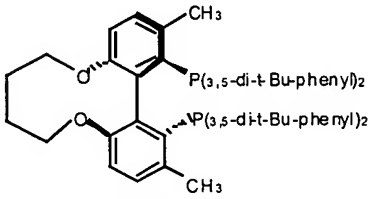
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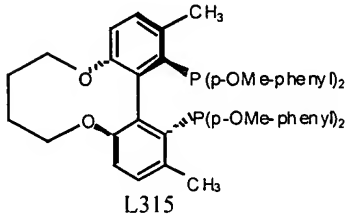
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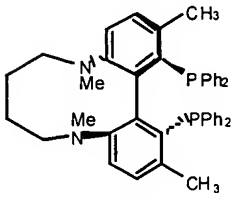
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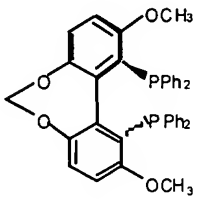
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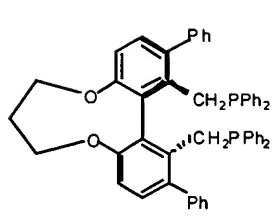

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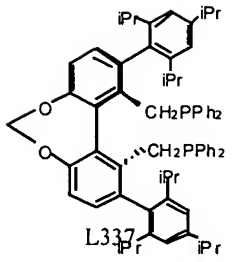

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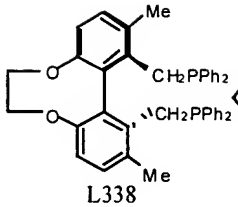

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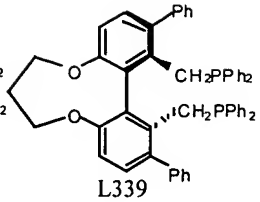

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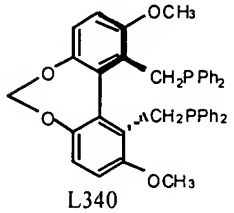

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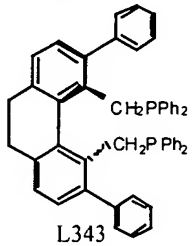

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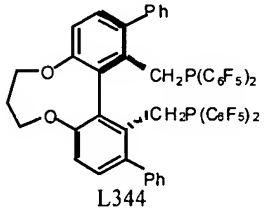

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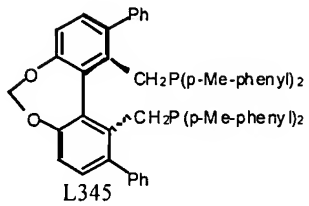

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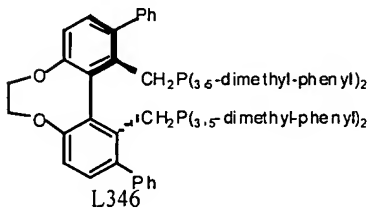

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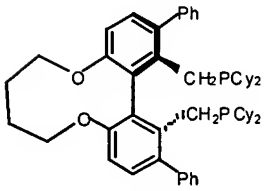

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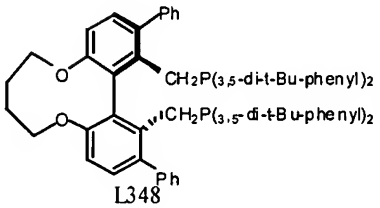

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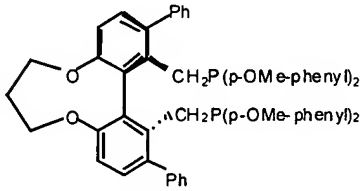

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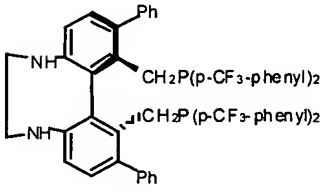

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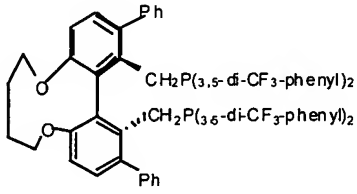

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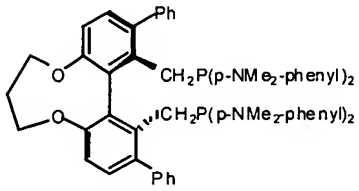
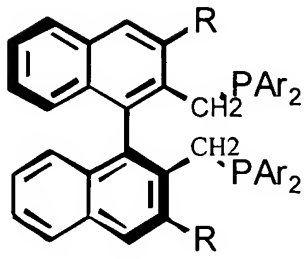


L352

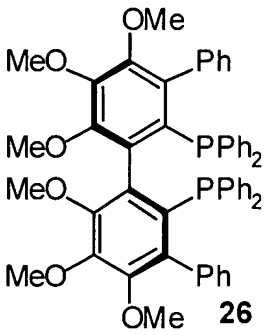
wherein Cy is a cyclohexyl group.

95. (new) The process of claim 71, wherein said ligand is represented by the formula:



wherein each R is independently selected from the group consisting of: alkyl, aryl, substituted alkyl, and substituted aryl; and wherein each Ar is independently selected from the group consisting of: phenyl, substituted phenyl, aryl and substituted aryl.

96. (new) The process of claim 71, wherein said ligand is represented by the formula:



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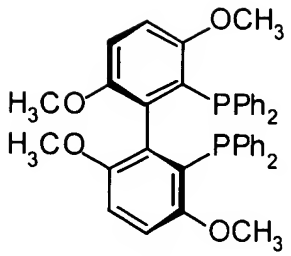
97. (new) The process of claim 71, wherein said ligand is represented by the formula:



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98. (new) The process of claim 71, wherein said transition metal is selected from the group consisting of:

Ag, Pt, Pd, Rh, Ru, Ir, Cu, Ni, Mo, Ti, V, Re and Mn.

99. (new) The process of claim 71, wherein said transition metal is selected from the group consisting of:

Pt, Pd, Rh and Ru.

100. (new) The process of claim 71, wherein said transition metal salt, or complex thereof, is selected from the group consisting of:

AgX; Ag(OTf); $Ag(OTf)_2$; AgOAc; $PtCl_2$; H_2PtCl_4; $Pd_2(DBA)_3$; $Pd(OAc)_2$; $PdCl_2(RCN)_2$; $(Pd(allyl)Cl)_2$; $Pd(PR_3)_4$; $(Rh(NBD)_2)X$; (Rh (NBD)Cl)$_2$; $(Rh(COD)Cl)_2$; $(Rh(COD)_2)X$; Rh(acac)$(CO)_2$; Rh(ethylene)$_2$(acac); (Rh(ethylene)$_2$Cl) $_2$; $RhCl(PPh_3)_3$; $Rh(CO)_2Cl_2$; $RuHX(L)_2$(diphosphine), $RuX_2(L)_2$ (diphosphine), Ru(arene)X_2(diphosphine), Ru(aryl group)X_2; Ru(RCOO)$_2$(diphosphine); Ru(methallyl)2(diphosphine); Ru(aryl group)$X_2(PPh_3)_3$; Ru(COD)(COT); Ru(COD)(COT)X; RuX_2(cymen); $Ru(COD)_n$; Ru(aryl group)X_2(diphosphine); $RuCl_2$(COD); $(Ru(COD)_2)X$; RuX_2(diphosphine); $RuCl_2(=CHR)(PR'_3)_2$; $Ru(ArH)Cl_2$; Ru(COD)$(methallyl)_2$; (Ir $(NBD)_2Cl)_2$; $(Ir(NBD)_2)X$; $(Ir(COD)_2Cl)_2$; $(Ir(COD)_2)X$; CuX $(NCCH_3)_4$; Cu(OTf); $Cu(OTf)_2$; Cu(Ar)X; CuX; $Ni(acac)_2$; NiX_2; $(Ni(allyl)X)_2$; $Ni(COD)_2$; $MoO_2(acac)_2$; $Ti(OiPr)_4$; $VO(acac)_2$; $MeReO_3$; MnX_2 and $Mn(acac)_2$; wherein each R

and R' is independently selected from the group consisting of: alkyl or aryl; Ar is an aryl group; and X is a counteranion.

101. (new) The process of claim claim 100, wherein L is a solvent molecule and wherein said counteranion X is selected from the group consisting of:

halogen, BF_4, $B(Ar)_4$, wherein Ar is fluorophenyl or 3,5-di-trifluoromethyl-1-phenyl, ClO_4, SbF_6, PF_6, CF_3SO_3, RCOO and a mixture thereof .

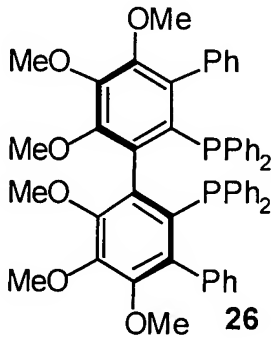
102. (new) The process of claim 71, prepared in situ or as an isolated compound.

103. (new) The process of claim 71, wherein said transition metal salt, or a complex thereof is selected from the group consisting of:

$[Rh(COD)Cl]_2$, $[Rh(COD)_2]X$, $[Ir(COD)Cl]_2$, $[Ir(COD)_2]X$, $Rh(acac)(CO)_2$, $Ni(allyl)X$, $Pd_2(dba)_3$, $[Pd(allyl)Cl]_2$, $Ru(RCOO)_2(diphosphine)$, $RuX_2(diphosphine)$, $Ru(methylallyl)_2(diphosphine)$ and $Ru(aryl)X_2(diphosphine)$, wherein X is selected from the group consisting of: BF_4, ClO_4, SbF_6, CF_3SO_3, Cl and Br; and

wherein said ligand is selected from the group consisting of compounds represented by the formula:

(a)



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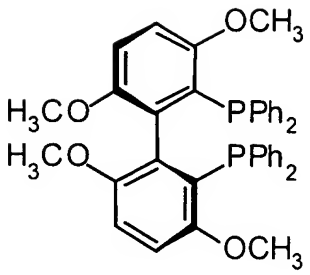
(b)



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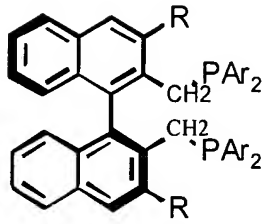
(c)



and a combination thereof.